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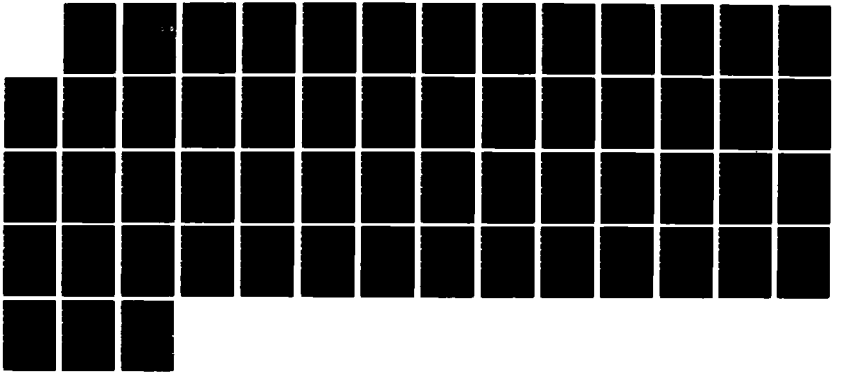

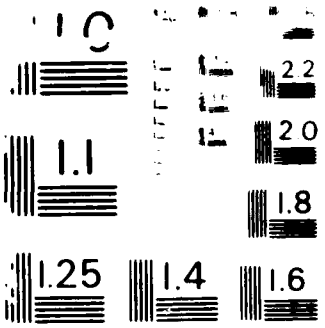
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The Interrelationship of Weapons and Doctrine
The case of the Bradley Infantry Fighting Vehicle

by

Major Benjamin C. Freakley

Infantry

School of Advanced Military Studies
U.S. Army Command and General Staff College
Fort Leavenworth, Kansas

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The premise is that current U. S. Army doctrine and tactical writings fail to make the maximum use of weapons that have been developed. The methodology used to defend this premise begins with an introduction to the problem and definitions. An historical review of the Spencer rifle, chemical weapons in WWI and the Sheridan tank illustrate the problem. Next, the Bradley technological development and doctrine is examined.

The monograph ends with an analysis of what effect the lack of doctrine has had on the Bradley and recommends a method to ensure that weapons and doctrine complement each other.

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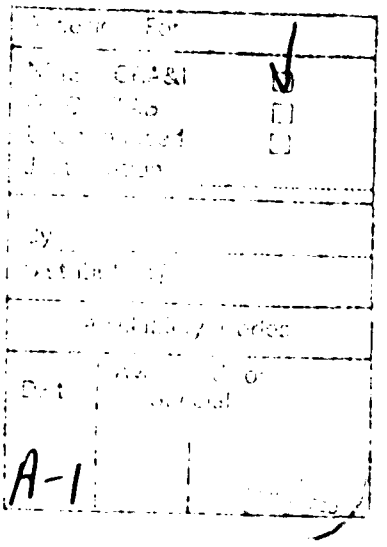

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ABSTRACT

THE INTERRELATIONSHIP OF WEAPONS AND DOCTRINE THE CASE OF THE BRADLEY INFANTRY FIGHTING VEHICLE by MAJ Benjamin C Freakley, USA, 50 pages

This monograph discusses how well U S Army doctrine exploits the development of weapons With the rapid ongoing modernization of our forces, it is imperative that the army make the most out of new technology

The premise is that current U S Army doctrine and tactical writings fail to make the maximum use of the weapons that have been developed The methodology used to defend this premise begins with an introduction to the problem Disclosing that the struggle between weapons and doctrine is not new, the introduction continues by arguing that it is critical to strike a balance between weapons and doctrine Next, the terms doctrine, tactics and technology are defined and their relationship to weapons is discussed

The monograph examines three historical cases to illustrate the problem and to reach some conclusions on how doctrine might have better exploited the weapons being discussed These examples are the Spencer repeating rifle in the Civil War, chemical weapons in World War I and the Sheridan armored reconnaissance assault vehicle that was developed in the 1960s

Following the historical analysis, the problem is updated by using the Bradley Infantry Fighting Vehicle as a case study The first step is a look at the technological development of the vehicle The genesis of the Bradley is reviewed from the half-track to the future BIFV A discussion of the impact of doctrine on Bradley growth and current employment follows the technological review

The monograph ends with an analysis of what effect the lack of doctrine has had on the Bradley and recommends a method to ensure that doctrine and weapons complement each other On the next high or mid-intensity battlefield, technology guarantees intense and highly destructive combat For the protection of U S Army soldiers and the survival of our nation, it is imperative that doctrine exploits new weapons

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I INTRODUCTION

> Our difficulty is not mainly in the design, manufacture, and use of our weapons as such Most of our weapons are more nearly perfect, taken as 'things in themselves,' 'than our enemies', the difficulty lies in the systems and methods of their use in battle, in tactics, and the design of weapons particularly suitable for use in the tactics now profitable.(1)

This statement written by Thomas Wintringham in 1943 was an attempt to bring British citizens to an understanding of warfare in order to win the Second World War What makes it interesting is that the relationship between weapons and doctrine has been a constant problem throughout history Even soldiers cannot agree what has more importance, the weapon or how it is employed.

Major General J F C Fuller, the noted British military theoretician, believed that "...tools, or weapons, if only the right ones can be discovered, form 99 percent of victory."(2) He argued that the "high superiority" of weapons was the dominant factor in warfare. At the other end of debate, General William E DePuy, an American practioner and theoretician, stated that the mission of an army is to organize, train, and equip forces He added to that mission, "...and to employ them properly."(3) Believing that doctrine was the key, General DePuy stressed the need for doctrine to keep pace with technology

The argument between warriors and technologists over the dominance of weapons versus doctrine has been on going for ages Which point is

correct is not important What is significant is that a balance between weapons and tactics must be struck. History points out that the difference between good armies and great ones is the effective combination of weapons and doctrine. The Roman phalanx, Swiss pikeman, and German Blitzkrieg all reflect this balance between new technology and the proper tactics which produces victory Failure to get the most out of a weapon system, or even to use it correctly, can result in disaster such as the French suffered in 1940 The French Army, with the same basic equipment as the Germans, was defeated because its doctrine did not maximize the capabilities of the tank.

And how are we doing with this dilemma today? The U.S. Army in the 1980's is acquiring new weapons at a rate unequaled in our history In the past, it has been the adoption of a single weapon used with imagination or the effective employment of weapons and organizations that revolutionized warfare, as in Napoleonic times Things are different today, however Now we are obtaining multiple weapons in all branches of service simultaneously. Systems not ordinarily thought of as weapons, like radios reconnaissance vehicles, and utility helicopters, are being procured to assist us in fighting war Add to these the multiple rocket launchers, new

artillery projectiles, automatic grenade launchers, improved rifles, night vision devices, infantry and cavalry fighting vehicles and you begin to see the magnitude of the problem. In 1986 alone, the army procured, "...5,000 M1 Abrams tanks, 3,700 Bradley fighting vechicles, 1,600 Apache and Black Hawk helicopters, 350 multiple-launch rocket systems...,"(4), and this is just a sampling of the modernization effort.

Many of the weapons have not been tested or proven in combat, yet they may have a significant impact of the conduct of battle. The question is, has doctrine kept pace? The purpose of this paper is to examine how well U.S. Army doctrine exploits weapons development. The scope of the paper limits an effective argument to an examination of a single weapon system. For this reason, the Bradley Infantry Fighting Vehicle (BIFV) will be examined as a case study of a recent attempt to integrate weapons and doctrine.

The premise is that current U. S. Army doctrine and tactical writings fail to make the maximum use of the weapons that have been developed.(5) The methodology used to defend this premise begins with definitions, followed by an historical review of weapons and tactics in the Civil War, the First World War and in the 1970's. Establishing this foundation of a recurring problem, we turn to the Bradley for specifics. Initially, an

examination of the technological development of the vehicle is discussed Then, the evolution of the doctrine for M2 employment is reviewed From this base, the BIFV and its supporting doctrine is analyzed Finally, recommendations for future weapon and doctrine development is offered

In this age of rapid weapon growth, it is imperative that we get the most out of our weapons As Tom Wintringham warned his nation, "Weapons have no meaning apart from the use of weapons, separated from tactics they become heavy and nobbly things for tired men to carry or drag"(6) Or, as I B Holley warned us in 1953, " it is probably not too much to suggest that the survival of entire cultures may hinge upon an ability to perfect superior weapons and exploit them fully"(7)

II DEFINITIONS

At this juncture, it will be helpful to identify terms used in this paper Doctrine is "fundamental principles by which military forces or elements thereof guide their actions in support of national objectives It is authoritative but requires judgment in application"(8) Tactics is the "art by which corps and smaller unit commanders translate potential combat power into victorious battles and engagements"(9) Techniques are "the manner in which technical details are treated or a method of accomplishing a desired aim"(10) In its own way, each of these terms

relate to weapons

Regarding doctrine, Major General Kenneth C Leuer, the Commandant of the U S Army's Infantry School, states that, "In theory, doctrine should guide the development of force structure and new equipment "(11) FM 100-5 says, "tactics, techniques, procedures, organizations, support structure, equipment and training must all derive from it (doctrine)"(12) From these statements, we see that doctrine should define the role of new weapons as well as provide a framework for future inventions and their tactical employment

Tactics, then, narrows the focus down to the use of the weapon system Weapons are an element of combat power used at the tactical level Tactical writings outline the specific employment of a weapon system on the battlefield and defines its relationship to other weapons (13)

Techniques detail the methods of driving, shooting, and maintaining w ..pons Also, they apply to drills or formations used to accomplish a desired task

Doctrine, tactics and techniques are the specific ideas that relate the technology to its use in battle Doctrine is the broad base outlining warfighting that narrows to technical employment of weapons As General Starry noted,

> Doctrine is what is written approved by an appropriate authority and published concerning the conduct of military affairs. Doctrine generally describes <u>how</u> the Army fights tactically, <u>how</u> tactics and weapon systems are integrated, <u>how</u> command control and combat service support are provided, <u>how</u> forces are mobilized, trained, deployed and employed (14)

With these terms in mind, an historical review of past attempts to integrate weapons and doctrine is necessary. In the past, did the U.S. Army make effective use of new weapons as they emerged? What did we learn from studying the armies of antiquity? Does General Starry's description of doctrine fit historical examples? Now, we turn to American history to find examples of the struggle between weapons and doctrine. This will give us a base to evaluate how well we are doing today in exploiting our developing weapons.

III. <u>HISTORICAL REVIEW</u>

The purpose of this review is to examine how effective the U.S. Army has been in employing new weapons. With this foundation, we will determine if ongoing Bradley development and employment is following any historical trend.

The weapons selected for examination include the Spencer rifle, chemical weapons in WWI and the Sheridan tank. In each example, we will outline the capabilities of the weapon system and compare it to other weapons of the time, if applicable. Next, doctrine is examined to see if

there is congruence between the weapon and tactics. Finally, we will determine if the doctrine capitalized on the potential of the new weapon

On May 18, 1863, Colonel John T. Wilder's Indiana Brigade received its Spencer repeating rifles. An added capability of this infantry unit was its mobility. The entire 2,500 man unit was mounted! Wilder's brigade had superior mobility and firepower when compared to other Union or Confederate infantry units. While the mobility plays a role, it is the firepower, the introduction of the new technology, the Spencer, that interests us.

Christopher Spencer patented his repeating rifle in 1860.(15) It was a 52-caliber, magazine-fed rifle. The seven-round magazine was placed into the butt of the rifle and the rounds were loaded into the chamber by means of a cocking lever which also served as a trigger guard. Wilder's troops only had one magazine per weapon requiring a reload between firings. This gave them a firing rate of about 14 rounds per minute. The maximum effective range of the Spencer was 500-600 yards, however its primary advantage was the volume of fire that it produced.

By 1863, most of the soldiers fighting in the Civil War were armed with the Springfield 58-caliber, muzzleloading, percussion-cap rifle. Firing a minie ball, the rifle had an effective range of 500 yards and it "could

hit larger targets like troop formations, at 800 yards, and at 1,000 yards the bullet retained sufficient terminal energy to penetrate four inches of soft pine"(16) Well-trained infantrymen could fire the Springfield four times a minute A disadvantage of the Springfield was that the firer had to stand up in order to reload

Comparing the Spencer to the Springfield, we note the following advantages created by the technology of the repeater The Spencer's volume of fire was three and a half times higher than the muzzleloader The prone position was used when firing the repeater giving soldiers more stability and protection when shooting Thus, Spencer technology brought increased and more accurate fires to the battlefield

Having equipped his men with new technology, Wilder should have changed tactics However, he used the same basic tactical formations found in other Union brigades Normally, units attacked with two lines, soldiers advancing shoulder to shoulder This formation was easy to command and control and allowed for the massing of fires These tactics evolved from General Winfield Scott's Infantry Tactics written in 1835 and used in the Mexican War, in which most Civil War leaders had fought Scott's manual called for advancing at the quick, 110 steps per minute At this pace units could cover 100-150 yards per minute Facing a musket

having an effective range of 200 yards, these tactics were sufficient and kept the advancing infantry in the killing zone for only a short time.

Just prior to the Civil War, William J. Hardee wrote Rifle and Light Infantry Tactics, "formerly an Academy text and now the official drill and tactics manual of both armies."(17) The basic change from Scott's method had the infantry advance at the double quick, 140 steps per minute. This was just short of a run. Although the units could cover the ground more quickly, they were in the killing zone longer because the ranges of both the Spencer and the Springfield were superior to that of the musket. Tactics had failed, despite Hardee's modifications, to account for the impact of the rifle.

Now, with the Spencer repeater available, the failure of tactics to adapt could have been catastrophic. Wilder had a tremendous inate advantage at Chickamauga because his superior firepower over the Confederates gave the Union an edge. Yet, when he dismounted, he still fought in the same formation as other Union brigades. The Indiana brigade had the ability to hold more ground and to inflict greater casualties on the enemy, based on superior firepower. Units with Springfields fought in mass formations to produce a sufficient volume of fire. Armed with Spencers, Wilder had the firepower to hold the same front with less men

However, neither Wilder nor his commander, General Rosecrans, used the unit to the fullest extent possible, thereby losing a tactical opportunity.

Because Chickamauga was the first battle where a major force was equipped with this technology, there was no written doctrine for the Spencer. The Union leadership failed to recognize the advantages offered in the Spencer.

The lack of doctrine prevented the adoption of the Spencer as the rifle of choice for the Union. At the end of the war, the Springfield continued to be the primary infantry weapon. As Professor I. B. Holley points out,

> The value of repeating arms was curtly dismissed by a Colonel of Ordnance, who pointed out that they had been known to misfire and that front-rank men would be 'more in dread of those behind than of the enemy.' That repeating arms would do away with the tactical maneuver of multiple ranks attacking in close order across open ground seems never to have occurred to this officer.(18)

The lack of an idea, a void in doctrine, failed to get the most out of the Spencer. The result was that soldiers continued to fight with old weapons and archaic tactics such as the frontal, line assault, which contributed to the horrible casualty lists of the Civil War.

In much the same way as the Spencer repeater, which was produced at the outbreak of the Civil War, chemical weapons were introduced at the

beginning of the First World War. On the 22nd of April 1915, German pioneer troops released 168 tons of chlorine gas into the French and British lines in the vicinity of Ypres Canal in Belgium. As the allies collapsed under the surprise chemical attack, the Germans advanced into the gas created gap. Equipped with rudimentary gas masks, in the form of cotton wadding, the attackers gained four and one-half miles in just a few hours. Finally stopped by hasty defenses, the Germans achieved great success with half the casualties as the allies. In the Ypres gas attack, the British and French suffered 5,900 casualties.(19) With this attack, chemicals made a place for themselves in the arsenal of war.

Soldiers of the American Expeditionary Force (AEF) arrived in France on 28 July 1917, 27 months after the battle of Ypres. The American Army was well aware of the effects of gas warfare, and should have had the doctrine to fight on the chemical battlefield. But as Major Heller points out in his excellent paper, *Chemical Warfare in World War I The American Experience, 1917-1918,*

> Given the advantage of viewing the development of chemical warfare from afar, the United States Army, upon entering the war, should have been in a position to operate in a chemical environment without repeating the costly experiences of the French, British, and Germans. Unfortunately, this was not to be the case.(20)

Although the Americans had British and French assistance, equipment and doctrine to study and learn from, the lessons were ignored. As the AEF got in the war emphasis on gas warfare steadily increased but too much time had been lost to train and instill the needed discipline for this type of combat. As a result, in defensive operations, troops failed to wear their masks properly and to decontaminate correctly. In the offense, American commanders were reluctant to use gas for fear of German retaliation. Yet, the Germans did not hesitate. "When looking at the total figures, 27.3 percent of all AEF casualties...were caused by gas."(21)

Major Heller sums it up best,

> Had the U.S. Army's leaders, prior to America's entry into the war, prepared themselves intellectually by studying German gas doctrine or by reviewing observer reports, gas officers would not have had to overcome such strong resistance to the tactical employment of chemicals. Because the U.S. Army failed to develop gas warfare doctrine, the average AEF officer never really understood the potential value of chemicals. Ignorance, shortsightedness and unpreparedness extracted a high toll at the front, a toll that the United States with its intellectual and technological resources should not have had to pay.(22)

If the U.S. Army had realized the lethality and the potential of gas weapons, we could have exploited this new technology for offensive

operations Additionally, by preparing for defensive operations, we would have prevented the high casualties inflicted by gas However, as in the case of the Spencer rifle, we have an example where the lack of doctrine, resulted in a failure to exploit a weapon properly

Turning to the Sheridan armored reconnaissance assault vehicle, we look at an example of a weapon produced prior to conflict, with doctrine and army requirements guiding its development In 1959 the United States, projecting a massive war against the Soviets on the plains of Europe, developed a cavalry doctrine to stem the flood of the Russian hordes Based on the doctrine, the army would produce three vehicles to help the cavalry carry out its assigned role

First, an M-113 personnel carrier would be developed for the transport of infantry An M-114 scout vehicle would complement the personnel carrier and perform point reconnassiance Finally, the M-551, Sheridan armored reconnaissance assault vehicle would provide fire support

The Sheridan had four basic requirements First, it had to be able to swim the smaller rivers in Europe Next, it had to be air-droppable With former World War II airborne commanders, such as General Maxwell Taylor as the Chief of Staff, and General James Gavin as chief of research and

development, the army was oriented on rapid deployability. An air-droppable Sheridan gave the airborne a coveted armored component. The third requirement was for a guided missile capability. Guided missile technology was advancing and many developers believed that it had an application to tanks. Finally, the vehicle had to fire a main gun round (152mm) with a combustible cartridge. This would prevent expended shell casings from filling up the turret floor.

In 1965, the army came out with the finished product to answer all these demands. The Sheridan weighed 17 tons, mounted a 152mm main gun which fired high explosive, canister, and white phosphorus rounds. Additionally, the Shillelagh missile could be fired through the gun-launcher. The vehicle had a 7.62mm coaxial machine gun and a searchlight. It was fitted with a grenade launcher for smoke screens and could cruise at 43 miles per hour. With minimum effort, a swim screen could be erected and the Sheridan could swim. It seems that the army had produced a light weight Goliath. Or had it?

The Sheridan was deployed to Vietnam in 1969 with no doctrine for this type of war. After all, it had been developed for war in Europe. It was fielded with the 11th Cavalry which integrated Sheridans with M-113's for fire support. Unfortunately, M-551s did not have a floor in the hull.

a result of the third airborne test wherein the bottom unexpectedly fell out Accordingly, developers removed the floor and reinforced the base of the vehicle However in Vietnam, the major threat to the Sheridan was mines To counter this, 1,000 pounds of armor were added to the bottom for protection With this added weight, the vehicle was no longer air-droppable Furthermore, in order to swim, the Sheridan required increased freeboard

Alarmingly, the missile was found to cause a build up of carbon monoxide in the turret, army developers advised that no more than four missiles per day be fired Moreover, when the missile was fired, it was recommended that dismounted soldiers be at least 500 yards away from the gun since some missiles fell short To make matters worse, the expendable cartridges on the 152mm rounds were dangerous and had a tendency to catch fire

Not suprisingly the maintenance record of the Sheridan was poor in the jungles requiring extensive operator care to ensure that the vehicle would function Finally, the M-551 could be penetrated by a B-40 rocket or a 50-caliber machinegun, causing a protection problem for the crew

Even with these acknowledged faults, the army argued that the Sheridan was essential because cavalry doctrine required a vehicle to

complement the reconnaissance M-114 and the personnel carrier However, by 1970 the Sheridan was costing the U. S. $335,000 per copy, the government had spent between $1.2 to $1.5 billion dollars to field this weapon (23)

Some would argue that the Sheridan was an outgrowth of doctrine But although the army had cavalry doctrine, we failed to define the role of the new weapon system. The focus had been too narrow with a "Europe only" deployment consideration. Because of competing requirements, the vehicle became a hybrid that could not swim, could not fight and could not be dropped from the air In the case of the Sheridan, doctrine failed to guide the development of the technology

Ironically, we may have at last identified the proper role for the Sheridan Today, this relatively "new" weapon system is found at the National Training Center, portraying a "Soviet Tank", the vehicle it was designed to fight in Europe

This brief historical review has pointed out the tension between weapons and doctrine In the case of the Spencer, an effective weapon was available to the Union army as early as 1861 However, the repeater was not adopted Its effectiveness was not demonstrated One of the reasons for this was a lack of doctrine to exploit the weapon With the

Spencer, troops could have fought in dispersed formations, defended ground in the prone position, and held wider frontages The Union forces failed to exploit the weapon.

With chemical weapons, the army saw a weapon being used against our allies and had time to react to the new technology Yet, we failed to heed the warnings and did not develop a doctrine to conduct offensive or defensive chemical warfare

Finally, with the Sheridan, we can see that history and experience had not improved our ability to integrate weapons and doctrine Starting from scratch with weapon design, we had a chance for doctrine to drive the growth of the weapon, as General Starry says it should Yet, we failed to produce the correct weapon for the reasons outlined

In an effort to see if we have learned anything from past mistakes, let us consider the Bradley Infantry Fighting Vehicle As a first step, we shall begin by looking at the technological evolution of the system

IV TECHNOLOGICAL DEVELOPMENT OF THE BRADLEY

The infantry fighting vehicle evolved from the armored personnel carriers (APC) used in the Second World War In that war, the U S Army carried infantrymen in the M3 half-track This open vehicle had poor off

road mobility Moreover, the soldiers riding in the back were vulnerable to artillery, grenade and small arms fire At the close of the war, the army fielded a fully enclosed carrier, the M44 "Unfortunately, the M44 was over-large for its task and its payload of 27 infantrymen fell awkwardly between the requirements of platoon and sections tactics"(24) In 1951 with an excess of aircraft engines available, the M75 was introduced, followed by the M59, which was amphibious The M59 was under-powered and had excessive interior heat and noise(25) Up to this point in time, the tactical role for these vehicles "was to carry the infantryman onto the objective, behind the tanks, and under air bursting artillery fire"(26)

In 1956 Tank Automotive Command produced the design requirements for the next series of APC's These requirements included,

--high level of protection against both artillery fragments and small arms fire for a 12-man squad of infantry soldiers
--high degree of cross country mobility
--ability to cross inland bodies of water
--transportability in aircraft that could carry 16,000 pounds(27)

The vehicle developed from these requirements was the M113 Becoming one of the world's most ubiquitious armored vehicles, the M113 carried a squad of twelve men and mounted a 50-caliber machine gun However, the "principal criticism of the M113 has been that it was designed only to transport infantrymen to or from the scene of their action"(28)

Each of the previously mentioned APCs were battle taxis When the infantry were mounted, they could not see the battlefield To get into the fight, the soldiers had to dismount "Mechanized infantry tactics for troops equipped with the M113 usually call for troops to attack or defend on foot, relying on vehicle-mounted machine guns for supporting fire"(29) What the army wanted was a vehicle that could support and fight

alongside tanks

In response to the cry for an infantry "fighting vehicle", the Pacific Car and Foundry Company conducted a concept study in 1964, and produced the XM701 This vehicle "was superior to the original M113 in having a 20mm gun turret and rifle ports as well as vision blocks for its riflemen"(30) The infantry could fight in this vehicle, and see the battlefield as they crossed the terrain However, its combat weight of 24 5 tons was considered too high and the XM701 was not bought by the army

Therefore, in 1967, FMC, the company which produces the M113, redesigned this popular APC by placing rifle ports and vision blocks in the troop compartment A 20mm gun cupola was added and the protection for the infantrymen was achieved by using steel armor This fighting vehicle was designated as the XM765(31) The complexity of this prototype, cost and the war in Vietnam ended further development of the XM765

The conclusion of the Vietnam War refocused the army on Europe, specifically on the Soviets The Russians fielded an infantry fighting vehicle known as the BMP in 1967 It has a low silhouette, swims, is fast and mounts a 73mm smooth-bore gun, a coaxial 7 62mm machine gun and an antitank guided weapon (ATGW)(32) It was the BMP, in addition to Soviet tanks, which grabbed the attention of U S Army developers

In 1972 the army produced new requirements for future fighting vehicles According to R M Ogorkiewicz, a noted journalist on armored fighting vehicles, these requirements

> which served as the basis of the development of the new mechanized infantry combat vehicle (MICV) called for a fully armored tracked vehicle capable of carring a squad of infantry and having a stabalized 20 to 30mm automatic cannon and a coaxial machine gun as well as rifle ports The MICV was to be capable also of swimming across

inland waterways and being transportable in C-141 and C-5 aircraft (33)

Given these new requirements, FMC went to work and produced the XM723 The prototype carried 12 men, organized with a driver, gunner, nine man dismount squad and a commander Firepower was produced by a one man turret, mounting a 20mm gun and a 7.62mm coaxial machine gun The turret was operated by both electric and hydraulic systems The men in the back could fire the M3A1, 45-caliber submachine gun through rifle ports The commander had his own cupola, mounted behind the driver's position The vehicle weight was 18 tons (34)

As the XM723 was being tested, major developments arose, impacting on the program In 1973 the Arab-Israeli War demonstrated the effectiveness of ATGMs Additionally, new analysis of Soviet armor raised questions about the ability of the 20mm gun to penetrate the BMP To add to this problem, Department of Defense analysts became focused on the massive Soviet armor threat in Europe Their greatest concern was the Russian advantage over NATO in tanks (three to one) One way to counter this mbalance was with ATGMs As these problems surfaced, developers looked for solutions and found a possible answer close at hand

Parallel to the MICV project, the army was testing the TOW Bushmaster Antitank Turret (TBAT) This two man turret was equipped with the 25mm Bushmaster chain gun and the tube launched, optically tracked, wire-command link guided (TOW) missile Adding the TBAT technology to the XM723 would give the vehicle the firepower to defeat the new BMPs and counter the Soviet armor with ATGMs

However, these changes in the XM723 would drive up production costs This worried successive Secretaries of Defense because the budget for this vehicle was a vast increase over what was usually spent on the

infantry

The final impact on XM723 growth occurred when the army changed its capstone doctrine in 1976 The new operations field manual, FM 100-5, oriented tactics on the "active defense." Let us examine each of these developments and their effect on the XM723 in turn

By the Arab-Israeli War of 1973, ATGMs had proliferated the battlefield "The initial Arab assaults made by armor and mechanized infantry, gained considerable ground Israeli tank forces, thrown against Egyptian and Syrian positions, were beaten back by heavy missile and gun fire The lesson for combat on both fronts was that armor could not make headway against the dense infantry antitank defenses unless it operated in a coordinated manner with infantry, combat engineers and artillery."(35) Accordingly, army leaders felt that they needed to ensure that the XM723 would work well with tanks and suppress antitank fires

In these years, doctrine as articulated in FM 100-5, stressed defensive tactics Yet, the XM723 was offensive in orientation Its purpose was to maintain the momentum of armored attacks The divergence between doctrine and weapons concerned the Congress and DoD, who wondered if the vehicle was a costly luxury

Moreover, aside from cost considerations, there was serious doubt about the abilities of the 20mm gun The army needed a gun that would suppress antitank missile systems as well as defeat the BMP With the increase in the front slope of the BMP and added armor, the concern was that the 20mm would not do the job

At the same time the TBAT program was advancing parallel to the MICV and was being considered as a turret for a future scout vehicle The technology offered many advantages over that in the XM723 turret

The Bushmaster could defeat Soviet light armor and suppress ATGMs The TOW could defeat tanks Developers began to examine the possibility of using the TBAT on the XM723

The biggest impact on the MICV program was from the DoD analysts With their concern over Soviet armor and the capabilities of the MICV n doubt, it appeared that the program was doomed to cancellation

> MICV was, in fact, going down the tubes in 1976 and had been formally canceled by DoD What revived the program and transformed it into the "fighting vehicle system" (the M2 and its companion M3 cavalry reconnaissance vehicle) was DoD's recognition from its own computer-modeled war-gaming studies that a vehicle as numerous on the battlefield as an IFV would have to be offered an excellent opportunity to proliferate antitank missile defenses (36)

General Donn Starry stated that "we, that is we in TRADOC (Training and Doctrine Command), decided to put the TOW on the MICV because we realized that if we did not put the TOW on the MICV we would probably never have an MICV"(37) The compromise to mount the TOW on the system satisyfing DoD and Congress, combined the XM723 into a fighting vehicle and tank destroyer, changing the IFV in several ways

The problems identified in the XM723 development were rectified by replacing the exisiting turret on the MICV with the TBAT "TBAT" answered many of the questions posed by DoD and Congress The TOW system increased the antitank density on the European battlefield The 25mm gun could destroy lightly armored vehicles, firing armor piercing ammunition at a greater range High explosive 25mm rounds would suppress antitank weapons These capabilities were added without an increase in personnel or vehicles In fact, the IFV reduced the size of the infantry squad from eleven down to nine men

The added size of the two man turret reduced some of the room in

the troop compartment Further encroachment on space was created by the need to store a reload for the TOW in the squad area These changes caused a reorganization of the squad Three men crew the vehicle as the driver, gunner and commander, six other soldiers fight from the back with the firing port weapons or dismount

Concern over the fielding an offensive weapon linked with the "active defense" was alleviated when the TOW was added to the vehicle The ATGM gave the XM723 a defensive role which nicely dovetailed into the current doctrine In fact, *Infantry* magazine stated in 1980 that "long range anti armor fire is one of the primary elements of the active mobile defense"(38)

Having combined the TBAT with the XM723, creating the XM2, the system was ready for production In 1981 the first vehicle left the line and final army testing began Two years later the first Bradley battalion was fielded at Fort Hood and the army had its infantry fighting vehicle And what was the product delivered to the army twenty five years after initial requirements were identified?

The M2, Bradley infantry fighting vehicle is a 24 5 ton, fully tracked, lightly armored system It can travel 300 miles at at speed of 45mph on highways The BIFV has the same cross-country speed as the M1 tank An erectable barrier gives the M2 a swimming capability The 25mm Bushmaster gun is stabilized permitting firing on the move The 7 62mm coaxial machine gun supplies additional protection for the Bradley The TOW missile system gives the vehicle the capability to destroy enemy tanks as distant as 3,000 meters Armament is completed with six ball mounted 5 56mm firing port weapons which the infantrymen in the rear of the vehicle use to fight from the M2

The TOW, 25mm gun and the 7.62mm machine gun are all aimed through the integrated sight which includes a thermal-imaging unit providing target acquisition under any conditions. The squad is protected by a hull made of aluminum armor with space laminate steel armor plates bolted onto the side. The turret is protected by a steel armor face. This armor shields the soldiers from artillery fragments and small arms fire up to and including 14.5mm heavy machine gun fire.

Additional protection comes from the vehicle speed and the ability to generate smoke screens. The 500 horsepower engine gives the Bradley the acceleration to dash from cover to cover. The smoke grenade launchers on the turret produce a smoke screen within seconds of firing. Also, the vehicle generates additional smoke by releasing fuel onto the exhaust manifold. Internally, the crew is protected from fire by the halon fire extinguishers.

Even with the notable characterisitics listed above, today the Bradley is under political fire. Critics from the media, Congress and within the army are voicing new concerns about the IFV. The size, cost, survivability, swimming capability and amount of infantry are in question. The Bradley is the largest of all of the world's IFVs and stands taller than the M1 tank. This results from the addition of the TBAT turret and by having a vehicle that will seat most American soldiers. The Soviets had solved this problem by having height restrictions placed on BMP infantrymen. The high silhouette causes the Bradley to stand out, making it an easier target.

The current cost of the Bradley is $1.2 million dollars each. The primary cost is in the optics and fire control systems. These systems were added on to the M2 with the TBAT.

Bradley survivability questions have been raised as a result of DoD

testing The primary concern is that the crew will be destroyed by simple hand-held Soviet rockets, similar to the B-40 which created problems for the Sheridan in Vietnam The stowage of additional ammunition, fuel and the aluminum armor is claimed to be a major disadvantage, but recent testing has proven that the aluminum will not burn and that the fire suppression system was effective in "instantly extinguishing fuel fires and making secondary fires of any kind-as opposed to explosions-unlikely"(39) Nonetheless, there was a sensationalist outburst against earlier army testing by the Congress and the media in the middle 1980s While the packaging of internal ammunition prevented any explosion from a fragmentation hit, secondary explosions did occur when there was a direct hit on the ammunition

In the future, the army is considering increasing protection for the squad This involves adding a Kevlar fabric armor antispall liner, reactive armor and moving ammunition and fuel to the outside of the vehicle However, current types of reactive armor will add at least one and a half tons of weight to the BIFV Similar to the Sheridan, these changes will slow the vehicle down, increase its profile and have a major impact on its fragile swimming capability Also, the additional weight will overload the transmission, which is already suffering excessive breakdowns

Swimming it turns out, is the current storm facing the M2 Several vehicles have sunk in testing and use Recently, a soldier died when a Bradley that was not rigged for swimming, sank in a hidden water-filled sinkhole Army data, however, shows that with over 10,000 swimming operations, there have only been about 12 sinkings,(40) and FMC is continuing to improve the swimming capability of the system Nonetheless, the controversy, fanned by those who have taken a liking to criticizing the

Bradley, continues

Another dispute surrounding the Bradley is over the amount of infantrymen it delivers to the fight. Retired Major General Richard Scholtes, a commander with recent Bradley experience states that, "Our 17,000-soldier Armored division with ten maneuver battalions can dismount a strength of only 960 infantrymen."(41) He questions whether this is enough for tactical success. With the reduction of the infantry squad from twelve to nine, there are concerns as to whether or not there are enough men to accomplish all of the dismount missions in combat.(42)

Finally, the role of the Bradley is in question by many. Its added antitank role causes the M2 to be a critical target for enemy tanks and ATGMs. Yet, its armor is not robust enough to slug it out with tanks, even with projected improvements in protection.

But the focus should not be on the mechanical adequacy of the machine. Throughout this paper the argument has been made that ideas must accompany weapon development. No matter how good the weapon is, wihout the proper tactics and techniques an advantage will not be gained. The IFV, no matter how refined as item of equipment it might be, used incorrectly, will be disastrous. "It is not without reason that after the 1973 Yom Kippur War it was reported that the Israelis judged the technically excellent BMP to be an 11 man coffin."(43) With these sobering thoughts in mind we turn to the development of Bradley doctrine.

V. BRADLEY and DOCTRINE

"We fielded the M1/M2 without doctrine."(44) Brigadier General John Kirk made this observation as the Assistant Division Commander of the 5th Mechanized Division. He is not alone in his assessment. In the keynote Address to the Armor Conference in 1977, General Depuy stated that,

'generally speaking, we in the American Army still haven't learned how to use our Panzer Grenadiers (mechanized infantrymen). Of all the forces on a very highly-mobile, highly-lethal, armor-dominated battlefield, armored infantry or mechanized infantry presents us with the most difficult problem of correct combat utilization."(45) The problems associated with employment of mechanized infantry were compounded with the introduction of ATGMs. General DePuy indicates that, "The antitank guided missile came into the army as a tag-a-long weapon with the infantry. The infantry didn't know how to use it because you put the infantry over in the woods and no place is quite so awkward for a 3,000 meter missile as a position over in the woods."(46)

In April 1978 the Infantry Fighting Vehicle Task Force Study Results confirmed the requirement for the Bradley. The Department of the Army directed study based its recommendations on existing doctrine. According to the report, "The U. S. Army fights an active defense. The objective of defense is to attrit (sic) and destroy the enemy-not to hold terrain."(47) The study further stated that a defense must possess antiarmor weapons in sufficient quanity and depth in order to absorb and defeat an enemy armored attack.(48)

Outlining the role of mechanized infantry, the Task Force determined that,

> It is capable of holding terrain dismounted. It can destroy tanks, lightly armored vehicles and infantry either mounted or dismounted. It can provide surveillance and security under all conditions either mounted or dismounted. But infantry is vulnerable to all weapons when dismounted and its current capabilities are limited by the infantry carrier (M113).(49)

Discussing the proper use of the TOW, the findings stated that, when possible, without degrading the IFV's role as a fighting vehicle, the IFV's ATGM will be employed to engage enemy armored vehicles and fortified

positions"(50)

This report combined with the army's leaders doubts about infantry tactics presented doctrine writers with several dilemmas The TRADOC Commander, General DePuy did not believe that the army had mechanized tactics right The TOW further compounded the role of the infantry The IFV Task Force stated the need for a high density of ATGMs, yet, it said that the TOW on an IFV should only be used without degrading the role of the vehicle Also, there was confusion concerning the mechanized infantry mission of holding terrain, on a battlefield where the objective was attrition of the enemy, not holding terrain' With writers trying to sort out these problems, there is little wonder why infantry fighting vehicle doctrine was not forthcoming Yet, the influence on emerging Bradley doctrine did not end here

Again, General DePuy writing in 1980 noted that,

> Defense analysts, preoccupied with the Russian tank threat, wished to convert the MICV into a primary tank killer This tendency was reinforced by the fact that the simulation models available to the analysts were never able to cope with the complexity or even the role of the mechanized infantry, and focused on the battles between tanks and antitank weapons For years all the simulation war games ended before the first infantry became involved 51)

Discussing the arguments over the simulation driven requirement to add a TOW to the MICV, General DePuy tells us that, "Conspicuous by its absence in all the debate was any meaningful discussion of its primary roles and missions as an infantry fighting vehicle"(52)

As the infantry fighting vehicle program continued with testing, the U S Army lacked a coherent mechanized infantry doctrine and the ideas to best exploit the IFV Moreover in 1982, FM 100-5, *Operations*, changed

from the "active defense" to "AirLand Battle" In the midst of all this, we were developing an expensive wonder weapon that no one knew how to employ In 1980, Brigadier General (Ret) Richard E Simpkin, the noted British theoritician of mechanized warfare, wrote,

> Yet, even articles in journals like *Infantry* by officers concerned with the MICV trials--and thus presumably enthusiastic--give very little indication of why they want this vehicle or how they will use it The approach is very much 'well, I guess we have to have this MICV, 'cos everybody else has one so otherwise we'll be disadvantaged (53)

Mechanized infantry doctrine should have been shaping the development of the vehicle and defining its role Instead, the vehicle produced the doctrine The Chief of Tactics at the U S Army's Infantry School, Lieutenant Colonel Michael H Hansen, in a speech to Canadian Officers in 1983, stated that, "We face very few changes at battalion level as a result of air-land battle doctrine The equipment and weapons we are bringing into our tactics are, on the other hand, forcing us to adjust our tactics Examples of these weapons are the M1 Abrams tank, the M2 Bradley infantry fighting vehicle and a host of other weapons and equipment "(54)

LTC Hansen's observations were reinforced by the Army Research Institute (ARI) In a report, based upon the examination of Bradley doctrine, ARI concluded that, "The delivery of BIFVs to units and the development of new concepts for employment have proceeded concurrently However, development of new or modified tactical guidance for operational employment of these capabilities, particularly at the levels of company/platoon/squad, have not kept pace "(55)

Serving as a staff officer at Seventh Army Training Command, during 1983, I observed that the only tactical guidance provided to the first

Bradley battalion was Special Text (ST) 7-7J, The Mechanized Infantry Platoon and Squad (Bradley) This ST, " was the first attempt to establish standard tactics, techniques, and operational procedures for the mechanized infantry platoon and squad equipped with the M2 Bradley fighting vehicle"(56) ST 7-7J, a good attempt to get doctrine into the hands of the soldiers who would have to fight the vehicle, left holes in the employment of the Bradley Tactical considerations above the platoon level were not available to commanders Furthermore, the doctrine did not take advantage of the superior technology Concepts exploiting the use of thermal sights, the speed of the Bradley and the best use of infantrymen were not present As a result, commanders facing a void in doctrine employed the BIFVs similar to M113s, forgoing the advantages created by the technology

We have determined that tactical employment did not accompany the development of the Bradley Doctrine did not shape the production of the IFV, computer based simulations and "knee jerk" reactions to the enemy provided the impetus Moreover, the initial units that received the new weapon did not have the guidance needed to take advantage of the technology We must now determine if current Bradley doctrine is getting the most out of the weapon system, four and a half years after coming into service

Field Manual 100-5, Operations, is the U S Army's capstone publication concerning warfighting "It furnishes the authoritative foundation for subordinate doctrine, force design, materiel acquisition, professional education, and individual and unit training"(57) In its role as a foundation for subordinate doctrine, FM 100-5 defines the missions of mechanized infantry It states that,

> Mechanized infantry complements armor through its ability to seize and hold ground. It provides overwatching antitank fires and suppresses enemy infantry and antitank guided missile elements. Infantrymen can dismount-
>
> To patrol difficult terrain
> To clear or emplace obstacles and minefields.
> To infiltrate and attack enemy positions
> To protect tanks in urban and wooded areas and in limited-visibility conditions.(58)

Furthermore, the manual goes on to state that, "When equipped with infantry fighting vehicles, the mechanized infantry can accompany tanks in mounted assault, although care must be taken in determining when and where infantry must dismount to accomplish their mission."(59)

From 100-5, two basic missions for mechanized infantry are defined In offensive operations, the primary function of IFV equipped infantry is to maintain the momentum of armored forces On the defense, infantry holds ground and protects the force, especially tanks

In light of these roles, we will examine current Bradley doctrine Checking the offensive employment of the vehicle and its dismounts, we will determine if the doctrine takes advantage of the weapon The process is repeated with defensive tasks The brief overview of doctrine will reveal if the U.S. Army is exploiting Bradley technology Additionally, the examination will assess how well the technology allows the infantry to accomplish the missions outlined in FM 100-5

The speed of the M2 gives it the capability to attack with the M1 tank Additionally, this strength makes the vehicle a tougher target for the enemy Combining the speed with the stabilized, 25mm Bushmaster, the infantry has in the Bradley a superb offensive weapon The BIFV supports armor attacks with two principal means Using 25mm high explosive ammunition, the Bradley suppresses enemy ATGMs Soviet BMPs are destroyed with 25mm armor piercing ammunition Moving in close

proximity to M1 tanks, M2 fires complement the tank and maximize both of the weapon systems The Bradley protects the tank, and the tank destroys enemy armor Our doctrine ascribes to this combined arms approach for the Bradley(60) However, when checking the manuals for TOW employment, doctrine limits the Bradley

FM 7-7J, The Mechanized Platoon and Squad (Bradley), states that one of the Bradley offensive capabilities allows the BFV to suppress enemy BMPs, tanks, and ATGMs at a relatively safe standoff distance, from long overwatch positions (1,500-3,000 meters)(61) In order to fire the TOW at a maximum standoff range, the Bradley must be stationary for 22 seconds This is the amount of time required for the missile flight While the BIFV is static it is highly vulnerable The large silhouette and light armor, combined with the TOW signature, make the M2 a standout target on the battlefield Acting as an antitank weapon, the vehicle is subject to intense artillery, tank and ATGM fires

Incidentally, the Soviets have fielded the BMP1 which shoots a 30mm cannon out to 3000 meters and an AT-5 (Spandrel) out to 4000 meters(62) These capabilities give Russian infantry the means to destroy Bradleys before they can be engaged by the M2's weapons

An additional aspect of using the TOW in offensive operations is pointed out by BG Simpkin When writing of the dilemma created by adding missiles onto armored vehicles, he believed that, "The ATGMs tend to drag the tank or the IFV back from where it ought to be into overwatching positions"(63)

Instead of being up to support the tanks maintaining the momentum, the Bradley is back, out of the close in fight From this position, the BIFV cannot suppress close in enemy infantry, ATGMs or BMPs in reverse

slope defenses Moreover, when the Bradley is in this tank destroyer role an additional infantryman must stay with the vehicle to reload the TOW This reduces the platoon dismount strength to 16 men, provided the platoon began at full strength

Continuing with the dismounted infantry, offensive doctrine assigns mechanized soldiers the missions to breach obstacles, suppress close in infantry, and assault enemy infantry Additionally, these soldiers conduct infiltrations gaining positional advantage to support tank and BIFV assaults by fire These missions ensure the momentum of the attack and protect the M1s and M2s (64)

Tactics specify Bradleys follow tanks, if available, when conducting mounted attacks These attacks are only to be undertaken against light resistance The infantryman's role in these attacks is to ensure a high volume of suppressive fire using the firing port weapon (65) The mounted assault doctrine is vague and does not account for Bradley technology If anything, the basic tactical manuals, FM 7-7J and FC 71-1J are too cautious when it comes to mounted assault (66) The doctrinal writings are replete with warnings concerning mounted assaults, because of the M2's light armor They fail to recognize the superior firepower and speed of the system Yet, the manuals place too much reliance on the capabilities of the firing port weapons

BIFV defensive tactics call for the destruction of the enemy and the controlling or retaining decisive terrain Discussing the use of BIFVs in defensive manuever, Field Circular 71-1J, The Tank and Mechanized Infantry Company Team, states, "The BFV must be positioned carefully to enable it to maximize both TOW and 25mm fires and to link up with the dismount team as necessary" (67) This type of guidance limits the

capabilities of the Bradley. The Bradley turret weapons require different siting to maximize their effectiveness. The vehicle must be level to fire the TOW. The 7.62mm coaxial machine gun should be in a position to place enfilade fire on the enemy. The gun, when firing 25mm armor piercing ammunition, should be placed to shoot on light armor avenues of approach, while high explosive fires are planned on likely enemy ATGM overwatch positions. This may sound complicated, but if the vehicle is not tied to terrain due to dismount or TOW considerations, the Bradley's weapons are a tremendous asset in the defense.

But the tactics in FM 7-7J and FC 71-1J tie the Bradley down. These manuals cite that there are four basic methods of BIFV employment in the defense, these being,

- -BFVs and rifle teams of the same battle position covering the same avenue of approach
- -BFVs and rifle teams on the same battle position covering different avenues of approach
- -BFVs and rifle teams on different battle positions covering the same avenue of approach
- -BFVs and dismount elements consolidated at company team level under company team control.(68)

These methods are restrictive and infer that the vehicle must be close to the dismounts. This is not the case at all. With the 25mm gun, infantry can be supported by vehicles from over 2000 meters. In fact, the vehicles can fight forward of the dismount defensive position and shape the battle by forcing the enemy into kill zones. We are too conservative in our tactics with the relationship of dismounts and vehicles. Mechanized infantrymen do not have to be tied to the Bradley. They can be supported by the system from great ranges. More importantly, they can operate independently, without the fighting vehicle.

Although the current doctrine has these shortcomings, for the most part, today's Bradley doctrine is improving to take advantage of

technology Care is taken to point out that the system is vulnerable because it is lightly armored. The 25mm gun is emphasized as the main weapon on the Bradley.(69) M2 units are capable of conducting the missions outlined for mechanized infantry in FM 100-5, however their capabilities are not unlimited. The greatest constraint is the amount of dismount infantry.

The problems in current publications are that we rely on the TOW too much and that the mechanized infantryman's role is too closely tied to the vehicle. This tactical guidance fails to use new technology to its fullest.

We have seen that the Bradley has been inhibited by doctrine in its development and initial employment. The U. S. Army must perfect weapons and exploit them with effective tactical guidance. Now, let us see how the Bradley has been affected because doctrine failed to exploit technology.

VI ASSESSMENT

To evaluate the interrelationship of weapons and doctrine, a model is necessary. In 1943 Thomas Wintringham proposed one in his book, The Story of Weapons and Tactics. He developed three primary elements in battle mobility, hitting power and protection.(70) Mr. Wintringham also added morale, but did not expand on it in his work. Colonel Huba Wass de Czege updated the model in his monograph, *Understanding and Developing Combat Power*. He stated that maneuver, firepower, protection and leadership are the keys to combat power.(71) Col Wass de Czege argued that his analytical framework was applicable to the identification of materiel needs and the development of doctrine.(72) With this model, the assessment of the Bradley and its doctrine is completed

The BIFV contributes to the element of maneuver with its speed and agility. It has a range of 300 miles, the same as the M113 but at double the fuel. Developed during the era of "active defense," the vehicle needed to sprint from cover to cover to fight this doctrine. Today with AirLand Battle doctrine, units need to move on the battlefield to strike deep at the enemy or to counterattack to disrupt enemy momentum. The Bradley with its higher fuel consumption better suits the old doctrine in this area. A Bradley battalion needs more fuel trucks. These additional vehicles slow down the overall maneuverability of the task force. In the active defense, task forces fell back on their supply base.

An initial requirement for the M2 was for the vehicle to swim. Balance this capability against the highly lethal battlefield and it becomes doubtful if the Bradley will ever swim when enemy forces are present. The M2's swim barrier can be destroyed by small arms fire or artillery fragments. If this happens the vehicle sinks. The barrier is a result of the increase in weight caused by adding the "BAT." The IFV developers stated that, "The weight of 46,000 or 47,000 pounds will force us to an erectable barrier for swimming similar to that on the M551 Sheridan."[3]

Recall that the IFV had to be deployable by C-141 or C-5 aircraft. This gave it strategic maneuverability. However the height was increased to make it swim enough to fit in the aircraft and to carry the infantry. Yet how much is strategy affected if we can only lift two M2s per C-141? Currently the strategic lift capability is limited. What additional burden will lifting Bradleys cause? Can the aircraft lift the vehicles if their weight is increased with extra armor?

With firepower the Bradley brings a host of weapons to the battle. The 25mm gun fulfills the true role of an infantry fighting vehicle. It

complements tanks so that armored momentum is maintained But, we have seen that that TOW was strapped on, not based upon history or doctrine, but because of war game simulations In 1979 *Army* magazine noted that, "DoD statements rarely stress the original mission of aiding and protecting one's own tanks in the armored assault, so that what was conceived as an offensive weapon is now seen primarily in a defensive context"(74) The TOW turned the M2 into a defensive vehicle And what of the TOW? BG Simpkin argues that the "IFV's antitank role is an emergency one or, at the most a stop gap mission"(75) However, current tactics employ the TOW as the rule not the exception And what did adding the TOW cost the infantry? Three men from each squad were lost due to turret size and TOW stowage In the antitank role a fourth man stays with the BIFV further reducing the dismount team to five Another result was that the men using the firing port weapons were forced to "observe and operate their firing port weapons at right angles to the line of fire"(76)

As to the utility of the firing port weapons, "while it is possible for IFV crews to use 5.56mm or 7.62mm personnel weapons from under armor cover there is no proof that such weapons can be effectively brought to bear at more than point blank ranges"(77) The Bradley firing port weapons are extremely difficult to use and have limited utility Also, the weapons must be removed from the back in order for the ramp to be lowered permitting infantry dismount

In regard to protection, it is clear that the Bradley is lightly armored as a result of the requirements to be air transportable and have the ability to swim Yet the fighting vehicle must be able to fight with tanks The speed of the vehicle offers some protection Correct tactical employment that uses intelligent terrain driving techniques provides more

Here, current doctrine is making the most out of the vehicle. However, the army is considering adding weight to the vehicle in the guise of protective (e.g. reactive) armor. This modification is based less on tactical requirements than on political pressure. A vehicle as heavy as a tank armed with only a 25mm gun is hardly cost effective. Better tactics might more effectively give the required protection to the vehicle without the debilitating trade offs.

Finally, leadership presents us some problems. Most of these are self imposed. Tactical writings are preoccupied about what leader dismounts and when. Additional concerns are over who commands the ground element versus the command of the vehicle element. These problems might have been avoided if we had stayed with a one man turret. At any rate, dealing with them is not difficult, and the current doctrine does cover the situation. Training and drills will solve the rest.

The discussion above illustrates how Colonel Wass de Czege's model might be used to assess new equipment and doctrine. As we use models like this one, the army must ensure that the role for the weapon is defined. As Lieutenant General Franz Uhle-Wettler stated in 1984, the "Infantry needs officers who take the trouble first to define the job they want their infantry to do and who then design the machines which their infantry requires for the job assigned."(78) This idea is central to the issue.

The army must settle this problem. LTG Uhle-Wettler, maintains that, "[t]he role of mounted infantry is battle against enemy infantry."(79) BG Simpkin says that, "Armored infantry maintains the mobility of the tanks, the IFV supports both the tank and its squad and maintains the mobility of both."(80) Col Wass de Czege argues that, "We

need infantry whose primary mission is to support the advance of the tank Let's call this armored infantry."(81) Finally,

> recent combat experience in the 1967 and 1973 Middle East Wars suggests that APC's or IFVs are generally used to fulfill the following roles. They provide suppressive direct fire cover for tanks against manportable antitank missiles and rocket launchers. They allow infantry to close with enemy units, providing protection against some anti-personnel weapons (fragmentation and bullets).(82)

If we take these roles and combat experiance, we can define the mission of the weapon. With the role developed and a model like Col Wass de Czege's, technologists and tacticians can ensure that doctrine exploits weapons. The Bradley is a fine weapon, and if its role is settled upon and its tactics refined, it will serve us well.

VII. CONCLUSIONS

Using the Bradley as a case study, we have determined that once again doctrine has not exploited technology. The U.S. Army has not heeded the warnings or advice of I.B. Holley or T.H. Wintringham, nor have we learned from history.

Comparing the Bradley to the historical examples used in this monograph, much as in the case of chemical weapons other nations had IFVs that we could have studied to assist us in our own development. Both the Germans and the Soviets had vehicles and doctrine prior to the fielding of the Bradley. Like the Sheridan, the Bradley could become a hybrid that does not suit anyone's purpose if doctrine does not maximize what we have. If we add extra armor to the BIFV, the vehicle will be slowed down and will not keep up with the M1. Reliability will be in question because the fragile transmission will be further stressed. Also, it will be a larger target, for which the Soviets can always build a bigger bullet.

The Bradley and the Spencer Rifle (in its day) were both good

weapons Like the Spencer, however, the BIFV needs tactical refinement If the infantry refrains from using the vehicle in the tank destroyer mode and dismount techniques are improved, Bradley use will be maximized However, this does not excuse developers for lagging behind technology with tactical doctrine It has been our good fortune that we have not had to use the Bradley in combat, and that we have had time to work with technology

And how does the future look regarding the integration of doctrine and technology? If a recent article in *Army* magazine is any indication, the future is not good The article, *The Mechanized Force In the Next Century*, is filled with descriptions of potential cost savings and common modules What is missing is how the weapons will complement doctrine In six pages, there is one brief statement that this program "would provide a complete blueprint for the mechanized force and ensure that the service's AirLand Battle doctrine is not saddled with obsolescent technology"(83) If we are to get the most out of emerging technology doctrine must drive the issue The army does not need to develop any more Sergeant Yorks or Vipers We need weapons that our soldiers can use to win on the battlefield

In summary, we return to Thomas Wintringham who warned us 44 years ago,

> more progressive nations sometimes take a breathing spell when customs and past ways of doing things are preserved by conservatism When societies of this sort go to war, their generals and other soldiers have an out-of-date idea of what war is like They do not alter their tactics to make full use of the new weapons that science and industry have made available Such societies produce armies that are usually destroyed by the armies of nations which are more ready to adopt new methods more ready to face changes and to learn quickly the use of new things (84)

ENDNOTES

1 Thomas Wintringham, The Story of Weapons and Tactics (Freeport Books for Libraries Press, 1971), p x

2 Major Robert L Maginnis, "Selecting Emerging Technology," Military Review (December 1986), p 33

3 General William E DePuy, "Keynote Address," Armor (July-August 1977), p 32

4 General John A Wickham Jr, "Vision and the Army of Today and Tomorrow," Army (October 1986), p 30

5 For an excellent review of weapons and tactics from 1946 to 1976 see Major Robert A Doughty's, The Evolution of U S Army Tactical Doctrine, 1946-76, Leavenworth Paper Number 1, (Combat Studies Institute, Fort Leavenworth Kansas, August 1979) In his conclusions, he assess that "Over the long term, the Army has placed a greater emphasis on the development of new weapons than on the development of how the new weapons should be employed" pp 47-48

6 Wintringham, op. cit., p xi

7 I B Holley, Ideas and Weapons (Hamden, Conn Archon Books, 1971), p 175

8 Department of Defense, Joint Chiefs of Staff Publication 1, Department of Defense Dictionary of Military and Associated Terms, p 118

9 Headquarters, Department of the Army, Field Manual 100-5, Operations, p 10

10 Henry Bosley Woolf, Editor, Webster's New Collegiate Dictionary (Springfield G & C Merriam Company, 1979), p 1188

11 Major General Kenneth C Leuer, "Infantry Doctrine-What Should It Be?" Infantry (September-October 1987), p 1

12 FM 100-5, op cit., p 6

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